10th Class 2017

Physics	Group-I	Paper-II
Time: 1.45 Hours	(Subjective Type)	Max. Marks: 48

(Part-I)

2. Write short answers to any FIVE (5) questions: 10

(i) Define longitudinal waves.

Ans Such waves in which motion of particles of medium is parallel to direction of motion of waves are called longitudinal waves. For example, sound waves.

(ii) What do you mean by amplitude?

Ans The maximum displacement below or above the mean position of a vibrating body is called amplitude.

(iii) Write two uses of ultrasound.

Ans Two uses of ultrasound are:

1. Powerful ultrasound is now being used to remove blood clots formed in arteries.
2. It can also be used to get pictures of thyroid gland for diagnosis purposes.

(iv) Define pitch.

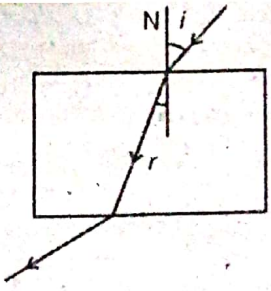
Ans The characteristic of sound by which we can distinguish between shrill and a grave sound is called pitch of sound.

(v) Define the intensity of sound.

Ans "Sound energy passing per second through a unit area held perpendicular to direction of propagation of sound waves is called intensity of sound."

(vi) State laws of refraction.

Ans 1. The incident ray, refracted ray and the normal at a point of incidence, all lie in the same plane.



2. The ratio of the sine of the angle of incidence ∠i to the sine of the angle of refraction ∠r always remains constant.

$$i.e., \quad n = \frac{\sin i}{\sin r}$$

(vii) Define Cystoscope and gastroscope.

Ans Cystoscope and gastroscope are the types of endoscope. As an endoscope is a medical instrument used for exploratory diagnostics, and surgical purposes. Cystoscope is used to examine the bladder and the gastroscope is for stomach.

(viii) Define nearsightedness.

Ans Some people cannot see distant objects clearly without the aid of spectacles. This defect of vision is known as short sight or nearsightedness and it may be due to the eyeball being too long.

3. Write short answers to any FIVE (5) questions: 10

(i) Explain any application of electrostatics.

Ans An electrostatic air cleaner is used in homes to relieve the discomfort of allergy sufferers. Air mixed with dust and pollen enters the device across a positively charged mesh.

(ii) Explain the variable capacitor with an example.

Ans Variable capacitor is generally a combination of many capacitors with air as dielectric. For example, such capacitors are usually utilized for tuning in radio sets. It consists two sets of plates. One set remains fixed while the other set can rotate so the distance between the plates does not change and they do not touch each other.

(iii) Define unit of current.

Ans The SI unit of electric current is ampere (A).

(iv) Define Ohm.

Ans The amount of current passing through a conductor is directly proportional to the potential difference applied across its ends, provided the temperature and the physical state of the conductor do not change.

Mathematically,

$$V \propto I$$

or $$V = IR$$

(v) If the length of copper wire is 1 m and its diameter is 2 mm, find its resistance.

Ans **Given data:**

$$L = 1 \text{ m}$$

$$d = 2 \text{ mm} = 2 \times 10^{-3} \text{ m}$$

To find:

Resistance = R = ?

Solution:

As we know,

Cross-sectional area of wire:

$$A = \frac{\pi d^2}{4}$$

$$= \frac{3.14 \times (2 \times 10^{-3})^2}{4}$$

$$\boxed{A = 3.14 \times 10^{-6} \text{ m}}$$

Specific resistance = $\rho = 1.69 \times 10^{-8} \ \Omega \text{ m}$

Now, we have

$$R = \rho \times \frac{L}{A}$$

By putting values,

$$R = 1.69 \times 10^{-8} \times \frac{1}{3.14 \times 10^{-6}}$$

$$\boxed{R = 5.4 \text{ m}\Omega}$$

(vi) State right hand rule for straight conductor.

Ans Grasp a length of wire with your right hand such that your thumb point in the direction of the current. Then fingers of your right hand circling the wire will point in the direction of the magnetic field.

(vii) Write two ways to increase the magnetic force.

Ans The magnetic force is increased if:

1. The current in the wire is increased.
2. Strength of magnetic field is increased.

(viii) Write two factors affecting induced e.m.f.

Ans The magnitude of induced e.m.f in a circuit depends on the following factors:

1. Speed of relative motion of the coil and the magnet.
2. Number of turns of the coil.

4. Write short answers to any Five (5) questions: 10

(i) Define electronics.

Ans Electronics is that branch of applied physics which deals with the control of motion of electrons using different devices.

(ii) Define thermionic emission.

Ans "The process of emission of electrons from hot metal surface is called the thermionic emission."

(iii) What do you mean by software?

Ans The term software means the computer programs and the manuals that support them. Computer programs are machine-readable instructions that direct the circuitry within the hardware parts of the CBIS to produce useful information from data.

(iv) What is meant by fax machine?

Ans Fax machine is a source to send the documents from one place to another through telephone lines.

(v) Define information and communication technology.

Ans Information and communication technology (ICT) is defined as the scientific methods and means to store,

process and transmit vast amounts of information in seconds with the help of electronic equipments.

(vi) **Define half-life.**

Ans Half-life is the time during which half of the unstable radioactive nuclei disintegrate.

(vii) **Define radioactive isotopes.**

Ans The stable and non-radioactive elements can be changed into radioactive elements by bombarding them with protons, neutrons or alpha particles. Such artificially produced radioactive elements are called radioactive isotopes or radio-isotopes.

(viii) **What do you mean by carbon dating?**

Ans The age of a dead human, animal or tree can be estimated by comparing the activity of carbon-14 in the live and dead tree. The technique is called carbon dating.

(Part-II)

NOTE: Attempt any TWO (2) questions.

Q.5.(a) Write a note on characteristics of sound. (4)

Ans **Characteristics of Sound:**

Sounds of different objects can be distinguished on the basis of different characteristics as described below:

Loudness:

Loudness is the characteristic of sound by which loud and faint sounds can be distinguished.

When we talk to our friends, our voice is low, but when we address a public gathering our voice is loud.

Pitch:

Pitch is the characteristic of sound by which we can distinguish between a shrill and a grave sound.

It depends upon the frequency. A higher pitch means a higher frequency and vice versa. The frequency of the voice of ladies and children is higher than that of men. Therefore, the voice of ladies and children is shrill and of high pitch.

Quality:

The characteristic of sound by which we can distinguish between two sounds of same loudness and pitch is called quality.

While standing outside a room, we can distinguish between the notes of a piano and a flute being played inside the room. This is due to the difference in the quality of these notes.

Intensity:

The sound waves transfer energy from the sounding body to the listener. The intensity of sound depends on the amplitude of sound wave and is defined as:

Sound energy passing per second through a unit area held perpendicular to the direction of propagation of sound waves is called intensity of sound.

Intensity is a physical quantity and can be measured accurately. The unit of intensity of sound is watt per square metre ($W\ m^{-2}$).

(b) An object and its image in a concave mirror are of the same height, yet inverted when the object is 20.0 cm from the mirror. What is the focal length of the mirror? (5)

Ans Given data:

Distance of object $p = 20$ cm

Distance of image $q = 20$ cm

To find:

Focal length = $f = ?$

Solution:

Using the formula:

$$\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$$

By putting values, we get.

$$\frac{1}{f} = \frac{1}{20} + \frac{1}{20}$$

$$\frac{1}{f} = \frac{1+1}{20}$$

$$\frac{1}{f} = \frac{2}{20}$$

$$f = \frac{20}{2}$$

$$f = 10 \text{ cm}$$

Q.6.(a) Write down the characteristics of parallel combination of resistors. (4)

Ans Parallel combination of resistors:

1. In parallel circuit, the total current is equal to the sum of the currents in various resistances. Thus,

$$I = I_1 + I_2 + I_3 \qquad ...(1)$$

Since the voltage across each resistance is V, so by Ohm's law

$$I_1 = \frac{V}{R_1},\ I_2 = \frac{V}{R_2} \text{ and } I_3 = \frac{V}{R_3}$$

Thus eq. 1 can be written as:

$$I = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

or $$I = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right) \qquad ...(2)$$

2. If we replace the combination of resistors with a single resistor called the equivalent resistance R_e such that the same current passes through the circuit, from Ohm's law $I = \frac{V}{R_e}$. Thus, eq. (2) becomes

$$\frac{V}{R_e} = V\left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}\right)$$

or $$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \qquad ...(3)$$

3. The reciprocal of equivalent resistance of a parallel combination is the sum of the reciprocal of the

individual resistances, which is less than the resistance of anyone of the resistor connected in this combination. If resistances R_1, R_2, R_3, ..., R_n are connected in parallel, the equivalent resistance of the combination will be given by:

$$\frac{1}{R_e} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ... + \frac{1}{R_n}$$

(b) A capacitor holds 0.03 Coulombs of charge when fully charged by a 6 volt battery. How much voltage would be required for it to hold 2 Coulombs of a charge? (5)

Ans Given data in SI units:

$Q = 0.03C$

$V = 6$ Volts

If $Q = 2C$

Then Voltage = ?

Firstly, we must find the capacitance

$C = ?$

The capacitor equation:

$Q = CV$

or $C = \frac{Q}{V}$

By putting the values:

$$C = \frac{0.03}{6}$$

$$C = 0.005 \text{ F}$$

Now voltage = ? = V

By using the equation : Q = CV

$$V = \frac{Q}{C} = \frac{2}{0.005}$$

$$V = 400 \text{ volts}$$

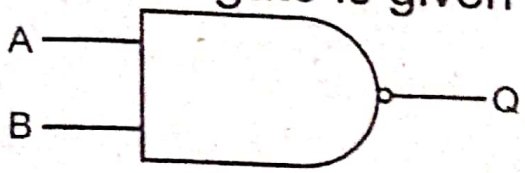
Q.7.(a) Define NAND gate, draw its symbol and write its truth table. (4)

Ans NAND Gate:

NAND gate is obtained by coupling a NOT gate with the output terminal of the AND gate.

Symbol:

The symbol of NAND gate is given below:



Truth table:

The truth table of NAND gate is given below:

A	B	$Q = \overline{A.B}$
0	0	1
0	1	1
1	0	1
1	1	0

(b) Cobalt-60 is a radioactive element with half-life of 5.25 years. What fraction of the original sample will be left after 26 years? (4)

Ans The half-life of Cobalt-60 is:

$T_{1/2} = 5.25$ years

Original activity $= A_0$

After time $T_{1/2}$, the activity will become $A_{0/2}$

After time $2T_{1/2} = 2 \times 5.25 = 10.50$ years $= A_{0/4}$

After time $3T_{1/2} = 3 \times 5.25 = 15.75$ years $= A_{0/8}$

After time $4T_{1/2} = 4 \times 5.25 = 21$ years $= A_{0/16}$

After time $5T_{1/2} = 5 \times 5.25 = 26.25$ years $= A_{0/32}$

Finally, after 26 years, less than $\left(\frac{1}{32}\right)$th of the original sample will be left.